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HEAVY METAL ANALYSIS Ni, Cr AND Zn ON SEDIMENT OF MAMUJU DISTRICT USING INDUCTIVELY COUPLED PLASMA OPTICAL EMISSION SPECTROSCOPY (ICP-OES)

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ABSTRACT

This study discusses the heavy metals of Ni and Zn in aquatic sediments of Mamuju Regency using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Sediment samples were taken at four different locations, namely Rimuku River Estuary, Manakara Beach Pier, Muara River Estuary and Mamuju River estuary. The results obtained for Ni metals ranged from 0.0005 - 0.0019 mg / L and Zn metals ranged from 0.0041 - 0.0066 mg / L and still below the threshold of metal quality standards in the sediment or can be said not polluted.

Keywords: Ni, Cr, Zn, Heavy Metals, ICP-OES, Sediment

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1. INTRODUCTION

West Sulawesi Province is an area located on the western side of Sulawesi Island which is a division of South Sulawesi Province. The province was formed on October 5, 2004 based on Law Number 26 of 2004 concerning the establishment of West Sulawesi Province (Statute Book of 2004 No. 105, Supplement to the State Gazette of the Republic of Indonesia Number 4422), the Provincial Government of West Sulawesi runs its government covering 6 District 69 District and 649 Kelurahan / Desa as the lowest government unit [1].

The total area of West Sulawesi Province is 16,937.16 square kilometers covering 5 districts. Mamuju Regency is the widest regency with an area of 8,014.06 square kilometers or area of the district is 47.32 percent from all region of West Sulawesi. The number of rivers flowing in West Sulawesi is recorded at 8 streams, with the largest flow in Polewali Mandar district, which is 5 river basins. The longest river is noted there are two rivers, namely Saddang River which flows covering Tator, Enrekang, Pinrang and Polewali Mandar and Karama Rivers in Mamuju District. The length of the two rivers is 150 km each [1].

The sea is the place where the river flows, both large rivers and streams. Thus, the sea will be a gathering place for pollutants carried by the river. Of the many wastes that exist in the sea, heavy metal

waste is the most dangerous waste because it causes toxic effects for humans [2]. Heavy metal pollution entering the aquatic environment of the river will dissolve in water and will accumulate in the sediment and may increase over time, depending on the environmental conditions of these waters [3]. Sedimentation occurring in a waters can affect, among others, on silting and changing the seabed landscape, water fertility, and biodiversity in one bay in Indonesia [4].

Based on the above description, that the anthropogenic and natural processes have the potential to increase the pollution of heavy metals in the water area. It is therefore necessary to know that the essential heavy metal content of Ni, Cr, Zn in sediments at the river mouth of Mamujum Regency uses inductively coupled plasma optical emission spectroscopy (ICP-OES) to anticipate changes in water quality due to urban development.

2. METHODS

2.1. Sediment Sampling

Samples were taken using Van Veen Grap Sampler. Sediment samples were taken at 4 different points as shown in Table 1.

Station I taken at the mouth of the Mamuju river, station II in front of Manakarra beach platform, station III at the mouth of the Rimuku river, and station IV at the mouth of the river Karema. Then the sample that has been obtained is inserted into the plastic bag where the sample has been provided previously.

2.2 Preparation of Sediment Samples

The wet sediment samples are dried by insertion into an oven at 100 °C. Samples that have dried, crushed until smooth by using porcelain crucible.

Table 1. Sampling Location

Station	Geographical location		Depth (meters)
	South latitude	East longitude	
I	02°39'53.5"	118°54'01.7"	1
II	02°40'12.1"	118°53'19.8"	3
III	02°40'25.9"	118°53'02.4"	2
IV	02°40'43.7"	118°52'24.1"	2

2.3 Analysis of Ni, Cr and Zn heavy metals using ICP-OES [5]

The sample was weighed as much as 1 gram and put into the crucible porcelain then sprinkled 2 grams of Na_2CO_3 then put into the furnace at a temperature of 800 °C for 2 hours. After that, the damaged sample was added aqua regia. Then stand for ± 12 hours. Then transferred into a beaker, then heated to almost dry. After that, the soluble sample was added 10 mL of Iacides, then filtered. The filtrate of filtrate was then introduced into a 50 mL measuring flask. Then squeezed with akuabides up to the boundary mark. Then analyzed using ICP-OES

3. RESULT AND DISCUSSION

3.1 Concentrations of Nikel Heavy Metals (Ni) in Sediments

The Ni logging into the waters comes from the land, either blown, drifted, or spills. Household waste such as detergent washing water that flows into the ocean can also carry Ni metal and settles with other metals.

Figure 1 shows that station 4 contains a Ni metal higher than any other station. High levels of Ni in station 4 is caused by residential activities and household industries located around the station. In addition, the site is also a landfill location that could have the material of the stock

carrying nickel metal and deposited into the waters. Likewise at station 3 which is the location of hoarding and get a lot of input from residential activities and household industries. In addition, in the upstream part of the station is the location of the plantation.

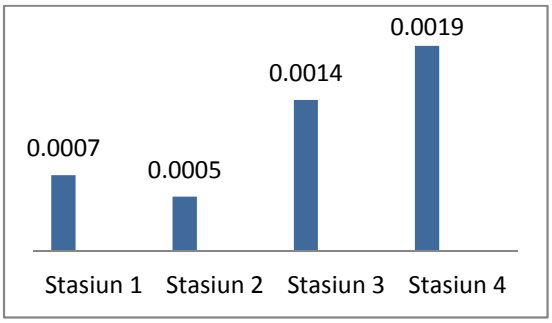

Figure 1. Diagram of Ni Concentration in Sediments at various Stations (mg/L)

The high concentration of Ni in the waters did not affect the depth of the sampling station. Can be seen on station 4 which is a station at a depth of 3 meters has a Ni metal concentration of 0.0019 mg / L. At station 2 which has a depth of 2 meters has a digital concentration of 0.0005 mg / L Ni. While at station 1 which has a depth of 1 meter has a Ni level of 0.0007 mg / L. The high level of metal content in some stations is not separated from the influence of the activities of the people around the waters. The range of Ni content in the water of Mamuju is 0.0005 - 0,0019 mg / L and still below the threshold value of Ni metal in the sediment is 75 ppm [6].

3.2 Concentrations of Heavy Metal Chromium (Cr) in Sediments

Chromium can enter the water bodies with duacara, that is natural and non-natural way. The inclusion of Cr naturally such as erosion or erosion of mineral rocks and dust or Cr particles present in the air will be lowered by rainwater. The entry of Cr is non-natural related to human activities such as industrial and household waste disposal to water bodies (Halija et al., 2012).

Figure 2 shows that the highest Cr metal concentration is at station 1, which is 0.006 mg / L.The high concentration of Cr metal at station 1 is caused by inputs from upland farming and plantation activities as well as downstream settlements and household industries. Cr metal concentration at 4 stations is also influenced by the depth of the station. Proven on station 1 with 1 meter depth having the highest concentration among other stations, while station 4 which has a depth of 3 meters has the lowest concentration. This is in accordance with the results of previous studies which suggest that in sedimen getting down from the surface has a heavy metal content is getting smaller [7][8].

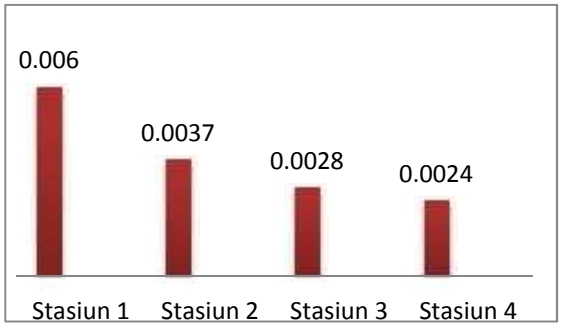

Figure 2. Diagram of CrConcentration in Sediments at various Stations (mg/L)

The range of Cr content of metal in Mamuju waters is 0.0024 - 0.0060 mg / L and still below the Cr metal threshold value in the sediment is 260 ppm (Yani et al.,2012).

3.3 Concentrations of Heavy Metal Zinc (Zn) in Sediments

The main sources of zinc in the environment are melting of metals, human activities and mining activities. Production and use of zinc in brass, rubber and paint can

release zinc to the environment through various waste streams (EPA, 2005). The source of Zn heavy metal contamination can come from various human activities that produce pollutant waste. The pollutants are transported by rainwater and the movement of water from the sea and freshwater to the mouth of the river which is a meeting place of marine waters and freshwater. Zn metal in waters is concentrated through biological and chemical-physics processes [9].

Figure 3 shows that the highest Zn metal content is at station 4.The high concentration of Zn metal at station 4 is influenced by the activities of household industry and the hoarding activity around the station. The absence of Zn concentrations in some stations has no effect on its depth. Proven on station 4 which has a depth of 3 meters has a Zn level of 0.0066, followed by stations 2 and 1 which has a depth of 2 and 1 meter respectively. The lowest concentration of Zn between stations is located at station 3 which has a depth of 2 meters that is 0.0041 mg / L.

The range of Zn metal content in Mamuju waters is 0.0041 - 0.0066 mg / L and is still below the Zn metal threshold value in sediments is 271 ppm.

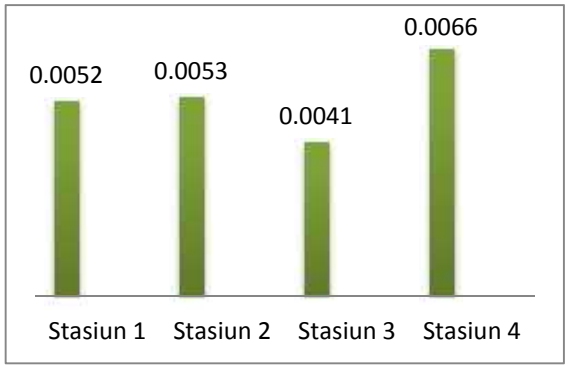

Figure 3. Diagram of ZnConcentration in Sediments at various Stations (mg/L)

3.3 Comparison of Co and V Heavy Metals Concentrations in Aquatic Sediments of Mamuju Regency

Figure 4 shows that; of the three metals contained in the sediment at each station, Zn is the metal having the highest content of the three metals then followed by Cr and the lowest Ni.

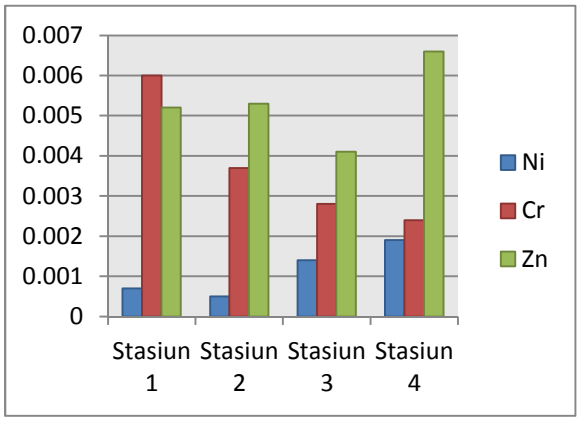

Figure 4. Concentration Diagram Ni, Cr and Zn (mg/L) in Sediments at various Stations

The presence of heavy metals in marine waters can come from various sources, including from mining activities, households, agricultural wastes and wasteindustry. Of the four types of waste, the most commonly heavy metal waste is industrial waste. This is due to heavy metal compounds often used in industry, either as raw materials, additives or catalysts. Increased levels of heavy metals in seawater will result in heavy metals originally required for various metabolic processes can turn into toxins for marine organisms. Besides being toxic, heavy metals will also accumulate in sediment and biota through the process of gravity [10].

4. CONCLUSION

Based on the research that has been done, it can be concluded that the heavy metal content in sediments in Mamuju waters for Ni metals ranges from 0.0005 - 0.0019 mg / L, for Cr ranges from 0.0024 - 0.0060 mg / L and for metal Zn ranges from 0.0041 - 0.0066 mg / L.

Of the three metals, the highest concentration of heavy metals in sediment is metal Zn. And still below the threshold of metal quality standards in the sediment or can be said not polluted.

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